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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/029,145	12/28/2001	Jung Il Kim	0465-0882P-SP	5232

2292 7590 08/08/2003

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EXAMINER
QI, ZHI QIANG

ART UNIT	PAPER NUMBER
2871	

DATE MAILED: 08/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/029,145	KIM ET AL.	
	Examiner	Art Unit	
	Mike Qi	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 June 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 8 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art (AAPA) in view of US 6,433,842 (Kaneko et al) and US 0070197 (Ahn).

Claim 1, AAPA discloses (paragraphs 05 – 26; Figs.1-2) an LCD device comprising:

- substrate (1);
- TFT having gate electrode (2a) and source (6)/drain (7) electrodes on the substrate (1);
- passivation film (8) formed on an entire surface of the substrate (1) and having contact hole (8a) in the drain electrode (7) of the TFT;
- pixel electrode (9a) connected to the drain electrode (7) thought the contact hole (8a), and the Fig.2 shows the drain electrode having a single-layer structure plus ohmic contact layer.

AAPA does not disclose the pixel electrode made of an amorphous transparent conductive film.

However, Kaneko discloses (col.5, lines 47-51) that amorphous indium tin oxide (a-ITO) or indium zinc oxide (IZO) (amorphous transparent conductive film) allows for use of a weak-acid etchant is preferably used as the material of the pixel electrodes so that the aluminum alloy (such as the drain electrode under the pixel electrode) is prevented from being damaged during etching of the pixel electrodes. Even though Kaneko discloses that the amorphous ITO is used in case of a layered structure for the drain lines, but Kaneko discloses the function of the amorphous ITO and the property of the amorphous ITO, and Kaneko indicates (col.5, lines 47-51) the amorphous ITO or IZO is preferably used as the material of the pixel electrodes so that the aluminum alloy is prevented from being damaged during etching of the pixel electrode. According to the making process, the material of the drain electrodes is aluminum or aluminum alloy. Kaneko also indicates (col.5, lines 59-61) that alternately, the drain lines may be composed of a single layer. Because the amorphous ITO or IZO having such property, the skilled in the art would be able to use the advantage of the property of the amorphous ITO or IZO to form the pixel electrode and preventing the contact failure with the drain electrode and protecting the drain electrode during etching for forming the pixel electrodes.

Besides, Ahn discloses (abstract) that using transparent electrode such as IZO (indium-zinc-oxide) having an amorphous structure would be etched within a short period of time with a low concentration of etchant, and preventing damages and bending of the transparent electrode upon the patterning thereof. In fact, the pixel electrode made of an amorphous transparent conductive material is common and

known in the art, because the pixel electrode made of amorphous transparent conductive material is etched by weak acid easily and rapidly, and then the metal electrodes such as the drain electrode is prevented from corrosion or damage.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use a pixel electrode made of an amorphous transparent conductive film as claimed in claim 1 for use of a weak-acid etchant so that the electrodes under the pixel electrode such as aluminum alloy is prevented from being damaged such as erosion during etching of the pixel electrodes and improving the pixel electrode contacting the electrode underneath.

Claim 8, AAPA discloses (paragraphs 05 – 26; Figs.1-2) that a pad structure of an LCD device comprising:

- substrate (1);
- gate electrode (2a) made from metal such as Al, Cr, or Al alloy (metal film) and gate pad (2b) made from metal such as Cu or Ti is formed on the substrate (1), and ;
- pixel electrode (9a) formed on the metal film, i.e., the gate electrode (2a) forming film.

AAPA does not expressly discloses an amorphous transparent conductive film formed on the metal film functions as a pad.

However, Kaneko discloses (col.5, lines 47-51) that amorphous indium tin oxide (a-ITO) or indium zinc oxide (IZO) (amorphous transparent conductive film) allows for use of a weak-acid etchant is preferably used as the material of the pixel electrodes so

that the aluminum alloy (the material of the electrodes is aluminum or aluminum alloy under the pixel electrode) is prevented from being damaged during etching of the pixel electrodes. As the same principle, the metal film as a pad that is the pad of electrode or for the gate line or data line, to prevent the metal film from damage also can use amorphous transparent conductive film formed on the metal film. Because the property of the amorphous transparent conductive film is etched by weak acid easily and rapidly, and then the metal film such as the pad is prevented from corrosion or damage.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use an amorphous transparent conductive film formed on the metal film such as a gate pad as claimed in claim 8 for use of a weak-acid etchant so that the metal pad under the amorphous transparent conductive film such as aluminum alloy is prevented from being damaged and improving the contacting for the metal pad underneath.

Claim 17, AAPA discloses (paragraphs 05 – 26; Figs.1-2) that a method for manufacturing an LCD device comprising:

- forming a gate line (100) including a gate electrode (2a) and gate pad (2b) on a lower substrate (1);
- forming a gate insulating film (3) on the entire surface of the substrate (1);
- forming a semiconductor film (4) above the gate electrode (2a);
- forming a data line (200) including a data pad (2c) to form source and drain electrodes (6,7) of a TFT at both sides above the semiconductor film (4);
- forming a passivation film (8) on the entire surface of the substrate (1);

- forming contact holes (such as 8a, 8b) in the drain electrode (7), the gate pad 92b) and the data pad (2c) of the TFT;
- forming transparent conductive film such as ITO film, in each pixel region, such as 9a, 9b, connected to the drain electrode (7), the gate pad (2b) and the data pad (2c) through contact holes (such as 8a, 8b).

AAPA doe not expressly discloses forming amorphous transparent conductive film in each pixel region.

However, Kaneko discloses (col.5, lines 47-51) that amorphous indium tin oxide (a-ITO) or indium zinc oxide (IZO) (amorphous transparent conductive film) allows for use of a weak-acid etchant is preferably used as the material of the pixel electrodes so that the aluminum alloy (the material of the electrodes is aluminum or aluminum alloy under the pixel electrode) is prevented from being damaged during etching of the pixel electrodes. As the same principle, the gate pad and the data pad made from metal, to prevent the metal film from damage also can use amorphous transparent conductive film formed on the metal film. Because the property of the amorphous transparent conductive film is etched by weak acid easily and rapidly, and then the metal film such as the gate and the data pad are prevented from corrosion or damage.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to form an amorphous transparent conductive film used as the pixel electrode in each pixel region as claimed in claim 17 for use of a weak-acid etchant so that the electrodes under the pixel electrode such as aluminum alloy or the metal gate pad and data pad are prevented from being damaged such as erosion during etching of

the pixel electrodes and improving the contacting for metal gate pad and data pad underneath.

3. Claims 2-5, 9-12, 18-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA and Kaneko and Ahn as applied to claims 1, 8 and 17 above, and further in view of US 5,135,581 (Tran et al).

Claims 2-5, 9-12, 18-22, Kaneko discloses (col.5, lines 47-51) that amorphous indium tin oxide (a-ITO) or indium zinc oxide (IZO) (amorphous transparent conductive film) allows for use of a weak-acid etchant is preferably used as the material of the pixel electrodes so that the aluminum alloy (the electrodes under the pixel electrode) is prevented from being damaged during etching of the pixel electrodes. Tran discloses (col.2, line 20 – col.3, line 5) that a process for forming a light transmissive electrically conductive composition at a temperature from 20°C to 300°C and sputtering occurs in a gaseous mixture comprising a sputtering gas and a stabilizing gas such as H_2 or H_2O. The pixel electrode made from amorphous ITO or IZO also is a light transmissive conductive composition. Tran indicates (col.2, line 20 – col.3, line 5) that such forming process at the temperature from 20°C to 300°C and containing such stabilizing gas H_2 or H_2O advantageously reduces the visible light absorption and renders more stable. Based on the prior art disclosed the temperature range, the skilled in the art would perform a suitable temperature range such as 150°C to 350°C, and that would have been at least obvious.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use amorphous ITO or amorphous IZO forming the pixel

electrode at a predetermined temperature and adding H_2 or H_2O as claimed in claims 2-5, 9-12 and 18-22 for reducing the visible light absorption and achieving more stable characteristics.

4. Claims 6-7,13-16 and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA and Kaneko and Ahn as applied to claims 1, 8 and 17 above, and further in view of Us 0029054 (Maeda et al).

Claims 6, 15 and 23, Maeda discloses (paragraphs 0100 – 0105) that the thickness of the transparent conductive thin film (such as the amorphous ITO film to form the pixel electrode) is preferably 50 to 200 nm (500 Å to 2000 Å) to prevent coloring caused by interference. Therefore, it would have been obvious to those skilled in the art at the time the invention was made to form the pixel electrode as claimed in claim 6, 15 and 22 for preventing the coloring cause by interference.

Claims 7, 16 and 24, AAPA discloses (paragraph 24) that the pixel electrodes also can be formed of polycrystal ITO and having a thickness of 500 Å.

Claims 13-14, AAPA discloses (paragraphs 05 – 26; Figs.1-2) that using metal film such as Cu or Ti to form the gate electrode (2a), and the data line is connected to the drain electrode (also made from conductive metal) so that using a same metal as a data line that would simplify the making process. Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use same metal material as the gate electrode and as a data line as claimed in claims 13-14 for simplifying the making process.

Claim 25, AAPA discloses (Fig.2) that the drain electrode (7) or the gate pad (2b) has a single-layer structure.

Response to Arguments

5. Applicant's arguments filed on Jun.23, 2003 have been fully considered but they are not persuasive.

Applicant's **only** arguments are as follows:

1) The reference Kaneko does not disclose the use of amorphous ITO as the pixel electrode when a drain electrode has a single-layer structure.

2) The reference Kaneko does not disclose forming an amorphous ITO on a metal film functioning as a pad for the LCD device and connected to the gate pad or the data pad.

Examiner's responses to the Applicant's **only** arguments as follows:

1) Kaneko discloses the function of the amorphous ITO and the property of the amorphous ITO, and Kaneko indicates (col.5, lines 47-51) the amorphous ITO or IZO is preferably used as the material of the pixel electrodes so that the aluminum alloy is prevented from being damaged during etching of the pixel electrode. According to the making process, the material of the drain electrodes is aluminum or aluminum alloy. Kaneko also indicates (col.5, lines 59-61) that alternately, the drain lines may be composed of a single layer. Because the amorphous ITO or IZO having such property, the skilled in the art would be able to use the advantage of the property of the amorphous ITO or IZO to form the pixel electrode when a drain electrode has a single-

layer structure and preventing the contact failure with the drain electrode and protecting the drain electrode during etching for forming the pixel electrodes.

2) Kaneko discloses (col.5, lines 47-51) that amorphous indium tin oxide (a-ITO) or indium zinc oxide (IZO) (amorphous transparent conductive film) allows for use of a weak-acid etchant is preferably used as the material of the pixel electrodes so that the aluminum alloy (the material of the electrodes is aluminum or aluminum alloy under the pixel electrode) is prevented from being damaged during etching of the pixel electrodes. As the same principle, the gate pad and the data pad made from metal, to prevent the metal film from damage also can use amorphous transparent conductive film formed on the metal film. Because the property of the amorphous transparent conductive film is etched by weak acid easily and rapidly, and then the metal film such as the gate and the data pad are prevented from corrosion or damage.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mike Qi whose telephone number is (703) 308-6213.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Mike Qi
July 25, 2003

TOAN TON
PRIMARY EXAMINER